Dispositional Aspects of Intelligence

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Student lawyers are among the most intelligent of students in the psychometric sense. They are able dedicated learners who have passed the hurdles of earlier education with excellent records. Moreover, good reasoning in terms of claims and evidence is central to their enterprise. Lawyers—student or professional—need to consider not only the side of the case they are committed to defending but the other side of the case, if only to anticipate the arguments of the opposition. One would suppose, then, that student lawyers would tend to reason well about everyday public issues, certainly considering both sides of the case with some care.

However, this does not seem to be the case. A number of years ago, we conducted a series of studies examining people's everyday reasoning about a range of issues, including questions such as "Would a nuclear disarmament treaty reduce the likelihood of world war?" and "Would a bottle deposit law in the state of Massachusetts reduce litter?" As a strong trend, people's reasoning on these issues proved very one-sided (Perkins, 1985; Perkins, Allen, & Hafner, 1983). Most people would adopt one or the other stance and say hardly anything about what reasoning might apply on the other side. One sample consisted of student lawyers from a well-known university. The student lawyers paid no more attention to the other side of the case than other participants. Moreover, the series of studies revealed a provocative pattern in the relationship between IQ, which was also measured, and attention to the other side of the case. The correlation between the two was zero. People with higher IQs were no more likely to attend to the other side of the case than people with lower

IQs, although people with higher IQs did tend to offer more elaborate justifications of their preferred side of the case (Perkins, Farady, & Bushey, 1991).

Thinking about the other side of the case is a perfect example of a good reasoning practice. It is a move one would ordinarily count as part of intelligent behavior. Why, then, do student lawyers with high IQs and training in reasoning that includes anticipating the arguments of the opposition prove to be as subject to confirmation bias or myside bias, as it has been called, than anyone else? To ask such a question is to raise fundamental issues about conceptions of intelligence, classic and modern.

Note that, although the students were asked to think about the issue, they were not asked specifically to think about the other side of the case. Any of them surely could have, as later studies affirmed (Perkins, 1989; Perkins, Farady, & Bushey, 1991). Most did not. Their behavior in this situation reflected not only what they were able to do, but what occurred to them to do and what they felt inclined to do. The point can be generalized: Intelligent behavior in realistic contexts is not just a matter of what a person is asked to do, nor even a matter of strong and clear situational demands. It is a matter of people's sensitivity to what the occasion invites, and of people's inclination to follow through. In sum, it is a matter of what are sometimes called thinking dispositions. This leads to the proposal that thinking dispositions need to take their place along side abilities as fundamental to any defensible conception of intelligence.

This article aims to define and clarify the concept of thinking dispositions, sketch its historical background, and introduce some empirical studies that make a case for the importance of dispositions in any account of the mechanisms of intelligent behavior. We take up these themes by addressing six questions in turn, as follows:

1. What are thinking dispositions?
2. Why are thinking dispositions important in modeling intelligent behavior?
3. Can thinking dispositions be measured and how?
4. How much do thinking dispositions contribute to intelligent behavior?
5. How do thinking dispositions relate to thinking abilities?
6. What kinds of thinking dispositions are there?

Inevitably, such an inquiry confronts the issue of what intelligence, as a technical concept, should mean. The last section addresses this question directly and attempts to place the notion of dispositions within a broad conception of intelligence.

What Are Thinking Dispositions?

The general idea of thinking dispositions is that people behave more or less intelligently governed not only by abilities but by predilections or tendencies. Everyday vocabulary includes a number of terms that testify to our readiness to characterize people's intellectual conduct in terms of tendencies as well as abilities. We speak of people as more or less open-minded, reasonable, thoughtful, skeptical, curious, and so on. Such attributions seem to address what people are inclined to do within the range of their ability. Closed-minded people could be open-minded in the sense that it is within their mental capacity. People who lack curiosity could be more inquiring.

The term "thinking dispositions" borrows from the lay use of the term disposition to refer to a predilection to exhibit a behavior under certain conditions, but a predilection neither necessary nor sufficient for the behavior. Accordingly, George may tend to be surly in the morning, but this neither means that George is always surly in the morning nor that other people without such a disposition are never surly in the morning. Another more

philosophical source for the concept of dispositions concerns what are called dispositional properties (Ryle, 1949). A dispositional property manifests itself only when certain preconditions are met. Brittleness, for example, is a tendency to shatter when struck. This contrasts with properties like color that become apparent upon observation without acting on the object.

Contemporary attention to dispositions in analyses of intelligence and thinking began with a key paper by philosopher Robert Ennis (1986). Ennis proposed that an analysis of good thinking in terms of abilities simply did not suffice and offered a taxonomy of a number of thinking abilities alongside a number of dispositions. Ennis's list of dispositions is discussed in a later section.

Since Ennis's seminal contribution, several scholars have included attention to dispositions in their analyses of thinking and intelligence. For example, dispositions play a central role in Baron's (1985) model of rationality. Baron distinguishes between dispositions and cognitive capacities. Capacity factors like short-term memory determine what in principle a person can do. Dispositional factors, in contrast, determine what a person does do within capacity limits. In particular, Baron analyzes good thinking in terms of broad search processes such as searches for possibilities and searches for evidence that one may be more or less well-equipped to carry out (capacities) and more or less inclined to carry out (dispositions).

Relatedly, Cacioppo and Petty (1982) introduced the dispositional trait *need for cognition*. This refers to people's readiness to invest in cognitively demanding activities and enjoyment in such activities. Need for cognition has proven to be a stable individual trait largely independent of psychometric intelligence and showing significant positive

correlations with school performance, thoughtful examination of arguments, and related matters (Cacioppo, Petty, Feinstein, & Jarvis, 1996). Further treatments that advance the case for the importance of dispositions—sometimes under that name and sometimes with other labels—include Dewey (1930) (good habits of mind), Facione, Sanchez, Facione, and Gainen (in press), Perkins, Tishman & Jay (1993), Langer (1980, 1989) (mindfulness), Passmore (1967), Paul (1990), Siegel (1988) (critical spirit), and Stanovich (1994) (dispositions toward rationality).

Most authors treat dispositions simply as tendencies, for example the tendency to think about the other side of the case. However, Perkins, Tishman, and Jay (1993) introduce a further ramification. They argue that a full account of intellectual behavior requires three logically distinct and separable components*: sensitivity*, *inclination*, and *ability*. Sensitivity concerns awareness of occasion; inclination concerns motivation or leaning; ability concerns capability to follow through appropriately. Recall, for example, the challenge of myside bias. To attend seriously to the other side of the case in naturalistic circumstances, a person would need to be sensitive to the occasion to seek otherside reasons, inclined to invest mental effort in examining the other side of the case, and of course have the basic ability to do so. Sensitivity, inclination, and ability constitute a triad of necessary and sufficient conditions for the target behavior.

Sensitivity and inclination make up the dispositional side of this story, the side that most authors have merged together into a general tendency. But logically, sensitivity and inclination are quite different from one another. It is perfectly possible to detect a certain kind of situation (sensitivity) but not care to invest oneself in doing something about it (inclination). It is also perfectly possible for occasions to pass one by (sensitivity) even

though in fact one cares quite a bit (inclination). Accordingly, an investigation of the dispositional side of good thinking needs to take into account both sensitivities and inclinations as somewhat separable contributing factors.

With this general perspective articulated, it is important to recognize three features of accounts of intelligent behavior that include dispositions. First of all, thinking dispositions are not necessarily positive, although cultivating positive thinking dispositions certainly is the educational interest. For example, closed-mindedness is a negative thinking disposition as much as open-mindedness is a positive one. Perkins (1995) identifies four broad negative thinking dispositions that mark all too much human thinking: the dispositions to be hasty, narrow, fuzzy, and sprawling in one's thinking. He argues that these can be attributed to the tendency for behavior, including thinking behavior, to automatize, as well as to other mechanisms such as ego defense and limited short-term memory capacity.

Second, while a number of scholars advance dispositions as a fundamental analytical construct, none view a disposition as monolithic in character. Open-mindedness, for instance, is not construed as one thing but a compound of beliefs, attitudes, sensitivities, and so on. No one advances a particular disposition as an "atomic" constituent of mind.

Third, it is important to distinguish the notion of dispositions from that of emotional intelligence, popularized in the recent book by Goleman (1995). Certainly dispositions bear a relation to emotional intelligence. They characteristically involve commitment to a particular stance, as in concern for open-mindedness or fairness or evidence. However, emotional intelligence as defined by Goleman addresses skills and understandings that specifically concern the handling of emotions—the management of one's own as well as sensitive response to others'. The scope of the concept of dispositions certainly includes this

but extends much more widely. It includes the motivational and cognitive roles emotions play in thinking, such as when thinking is driven by curiosity or a passion for truth. Moreover, dispositions have many non-emotional aspects. A disposition can reflect a habit or policy rather than a felt commitment.

Why are Thinking Dispositions Important for Modeling Intelligent Behavior?

Thinking dispositions have emerged over the past several years as an important construct in accounting for more and less intelligent behavior. What motivates attention to this construct? Two factors appear to be important. First of all, the notion of thinking dispositions honors the recognition in our everyday language and behavior of patterns of thinking of a dispositional character—open-mindedness, skepticism, and so on, as already noted. Of course, the presence in folk psychology of such notions does not demonstrate their psychological reality. Nonetheless, it recommends attention to them.

Secondly, an account of more and less intelligent behavior in terms of abilities alone leaves a logical gap. An ability to perform in a certain way—for instance to solve verbal analogy problems or to think about the other side of the case—does not in itself guarantee that the person will marshal such abilities on appropriate occasions. To do so, the person has to detect these occasions and follow through with the appropriate effort. Our opening anecdote of the student lawyers speaks to this point. Clearly capable of reasoning carefully about the other side of the case, the lawyers (and other subjects) by and large did not do so. In general, the notion of dispositions is an explanatory construct that addresses the gap between ability and performance by hypothesizing broad characterological traits that dispose some people more than others to marshal their abilities.

Attention to dispositions is further motivated by the ability-centric character of most efforts to account for why some people fairly consistently exhibit more intelligent behavior and some less over a range of test-like and real-world situations. The predominant view of intelligence for three-quarters of a century has been IQ or *g* theory, as articulated originally by Spearman (1904), plainly a theory that foregrounds ability. While *g* theory treats general intelligence as unitary in character, numerous challenges have been mounted against such a posture. For example, Horn and Cattell (1966) proposed the distinction between fluid and crystallized intelligence, the former reflecting performance on novel tasks demanding complex reasoning, the latter reflecting consolidated skills and knowledge such as vocabulary. Guilford (1980; Guilford & Hoepfner, 1971) introduced 150 factors involved in intelligence, generated by the cells created by three dimensions: 5 operations x 5 kinds of content x 6 kinds of products. Gardner (1983) proposed at least seven distinct intelligences, including linguistic intelligence (dealing with words), musical intelligence, logical-mathematical intelligence, spatial intelligence (as in art, architecture), bodily-kinesthetic intelligence (as in dance, sports), interpersonal intelligence (dealing with others), and intrapersonal intelligence (awareness and handling of self), Sternberg (1985), in his triarchic theory of intelligence, argued for three interacting aspects of intelligence—practical intelligence, concerned with adapting to, reshaping, and selecting particular environments; experiential or creative intelligence, concerned with orienting to and automatizing novelty; and componential intelligence, concerned with effective information processing and metacognition. While other challenges to the hegemony of *g* could be mentioned as well, most such counterproposals share an important characteristic with *g* theory: They are ability-centric accounts of human intelligence. They deal with what people *can* do on demand if

motivated, but do not so much deal with what people actually do within the range of their capabilities.

Binet, the other principal figure with Spearman in the development of intelligence testing, had a broader perspective. He viewed intelligence as a polymorphous attribute, a grab-bag of diverse intellectual skills and attitudes (Binet & Simon, 1911). An intelligence test was simply a crude measure of how much was in the bag. Indeed, the authors of the other theories of intelligence cited above surely are aware that more than ability shapes intellectual behavior. However, the tradition of theories of intelligence as it has developed apparently says that such theories are supposed to be theories of ability, so ability-centric theories are put forward.

The notion of dispositions is more akin to that of personality than ability. Indeed, broad personality attributes relate to intellectual behavior, for example the *conscientiousness* and the *openness* (sometimes other names are used) "superfactors" in the well-known five-factor model of personality (e.g. Cacioppo, et al, 1996; Digman, 1990). Personality traits of course influence performance within the range of a person's capability. Conventional intelligence testing tends to suppress their influence, because it creates a high-demand highly-cued situation. People know that they are supposed to perform well and generally strive to do so. Also, people know what tasks they are supposed to attempt—for example, solving verbal analogy problems or completing number series. They do not have to detect imbedded and implicit occasions for thinking more carefully or deeply, as is the case in more realistic situations. Likewise, conventional intelligence tests tend to suppress the hypothesized influence of thinking dispositions. Recalling the analysis of dispositions in terms of inclination and sensitivity outlined earlier, intelligence tests create highly

motivating conditions so that a person's general inclination to invest in thinking is less relevant; and create highly cued conditions so that a person's general sensitivity to occasion is less relevant.

Such circumstances are of course quite artificial. Thinking dispositions, like as personality traits, come into their own in more natural circumstances of moderate to low demand and of embedded rather than highly salient cues. Thinking dispositions contrast with personality traits largely in their focus on thinking behavior specifically. Personality traits are a construct aimed at accounting for a wide range of people's conduct, not just their conduct in handling intellectual tasks.

While these factors motivate attention to thinking dispositions, they do not of course validate the construct. As with personality traits, basic questions have to be asked: Can one measure thinking dispositions? Are thinking dispositions stable attributes of a person? The study of thinking dispositions is a relatively new field and we only have the beginnings of answers to such questions. Nonetheless, even the beginnings are informative.

Can Thinking Dispositions be Measured and How?

At least two approaches to measuring dispositions have appeared over the past several years: a self-rating approach and a behavioral approach. One case of the former is the measure of *need for cognition* mentioned earlier. The developers used a 5-point self-rating system for a battery of questions such as *I would prefer complex to simple problems* and *I feel relief rather than satisfaction after completing a task that required a lot of mental effort* (Cacioppo, et al, 1996). While these researchers did not focus on thinking dispositions by name, Peter and Noreen Facione (1992; Facione, Sanchez, Facione, & Gainen, 1994) have conducted investigations of thinking dispositions and developed a taxonomy of

thinking dispositions by having students rate themselves on a long list of traits such as: *We can never really learn the truth about most things,* and *The best argument for an idea is how you feel about it at the moment.* The Faciones conducted a factor analysis of these ratings and interpreted the results in terms of 7 subdispositions (They prefer to speak of one overarching disposition to critical thinking ramified into subdispositions): open-mindedness, inquisitiveness, systematicity, analyticity, truth-seeking, critical thinking self-confidence, and maturity. This lead to the design of the *California Critical Thinking Dispositions Inventory* (Facione & Facione, 1992), a 75 item survey, to which subjects respond item by item using a six-point Likert scale ranging from "strongly agree" to "strongly disagree."

The second and behavioral approach looks not to self-ratings but to actual conduct in situations that invite thinking. The design of a methodology requires careful attention to two points. First of all, the testing must avoid the high-demand, highly-cued character of typical testing of intellectual performance, because the test-taker must have the elbow room to detect or not detect and to invest or not invest in the kinds of thinking afforded. Second, if the measurement aims to distinguish between the contribution of ability and disposition to intellectual performance, the testing must include a way to determine ability, in order to compare it to subjects' non-cued, or open-ended, performance. Often this involves a two or three pass testing paradigm, in which subjects receive non-cued then more cued versions of a task.

More than one such methodology has been developed. Perkins, et al, (1991) studying myside bias, asked subjects to reason about everyday issues aloud, and then scaffolded by asking for more reasons on both sides of the case. This study will be discussed later. Norris (1994**), in an effort to distinguish between the contribution of disposition and

ability on critical thinking test performance, provided some test-takers with "surrogate dispositions"—guidelines identifying the kind of critical thinking called for on the test, such as "seek alternative explanations"—and compared their test scores to examinees who did not receive the surrogates. His rationale was that the surrogate dispositions could only be enacted if the subject already had the abilities needed to support them.

Ennis (1994), in a theoretical analysis of different approaches to measuring dispositions, argued for a guided, open-ended approach that is designed to elicit full dispositional behavior without separating out the contribution of ability. One such procedure he has found promising asks subjects to take a multiple-choice critical thinking test, and then provide written justification for their answers.

Stanovich and West (1997), in an effort to explore the separability of cognitive skills and thinking dispositions as predictors of reasoning performance, has developed a methodology that makes novel use of a two-task sequence. The methodology first measures subjects' prior beliefs about a controversial topic. Then, on an instrument administered later, subjects are asked to evaluate the quality of arguments related to the controversial topic. Results indicate that even after controlling for cognitive capacities, individual differences can be predicted by thinking dispositions—revealed in the first instrument—such as dogmatism and absolutism, and open-mindedness.

We describe in somewhat more detail a methodology we designed not only to contrast dispositions with abilities but to discriminate sensitivity, inclination, and ability. The research paradigm consists in a sequence of three related tasks, each of which corresponds to an element of triad. The sequence works as follows.

First, subjects read a very short story (about a paragraph long). Embedded in the

story is a thinking shortfall. For example, in one story, a woman Mrs. Perez faces a decision about what to do when the company she works for relocates. The shortcoming in Mrs. Perez's thinking is that she fails to look for options other than the obvious ones, even though the situation warrants a broader search. In this first task, subjects are asked to underline any portion of the story they think reflects poor thinking, and to make a note in the margin explaining what's wrong with the thinking and how it might be made better. In the Mrs. Perez story, the target portion of the text occurs when Mrs. Perez says she will relocate with the company, even though neither she nor her daughter particularly want to move. "I have no other choice," said Mrs. Perez. "There's no other decision I can think of in this situation." Task one reveals sensitivity, because it asks the subject to detect an occasion for a certain kind of thinking and indicate a direction for improvement.

In the second task, subjects are presented with the now-disembedded shortcoming and asked whether they think the shortcoming is problematic, and, if so, what should be done about it. For example, in the Perez story, the second task states: "Some of Mrs. Perez's friends think she should have tried to find more options. Other friends believe she tried hard enough to find options. Suppose you were in Mrs. Perez's place. What would your thinking be like?" In this second task, the disembedded shortcoming "stands in" for sensitivity, and effectively says to the subject: "Here's a potential problem; how are you inclined to think it through?"

In the third and final task, the task-design stands in for both sensitivity and inclination, so that all that remains is an ability task. For example, in the Perez story, subjects are straightforwardly asked to list several other options for Mrs. Perez, thus revealing their ability to generate alternative options, independently of their sensitivity or

inclination to do so.

How Much do Thinking Dispositions Contribute to Intelligent Behavior?

Such a methodology and others like it have the potential of identifying stable sensitivities and inclinations in individuals. In this developing field, validating measures with respect to test-retest reliability and other considerations is a substantial undertaking on which we have made only limited progress. Much of our work has focussed not on whether dispositions are stable traits of individuals but whether, indeed, the dispositional side of thinking makes an important contribution at all to intelligent behavior. If not, then how stable the dispositional side of thinking may be is a moot point, since it would explain little in any case. We have conducted four studies to date that address this issue and further studies are underway.

Study #1. This study includes the group of student lawyers mentioned at the outset. Undertaken a number of years ago, it predates, and indeed motivated, much of theory outlined here and does not reflect the full methodology described above. The principal investigation involved 320 subjects ranging from freshman in high school through college students and graduate students to people who had been out of school a number of years. As noted earlier, issues current at the time were posed to subjects. They were asked to think about them for a while, arrive at a position if they felt comfortable doing so, and then explain their reasoning. Pretesting of the issues permitted selecting issues that were genuinely vexed (some people preferred one side, some the other) and complex (a number of reasons could be advanced on both sides).

While a number of findings have interest, here we will focus on the pattern of results

around myside bias, which speaks most directly to the theme of this article. Across all ages, and in follow-up studies, subjects showed a strong tendency to elaborate reasons on their preferred side of the case while neglecting the other side. On the average, subjects offered about 1/3 as many considerations on the other side of the case as on their preferred side, including possible objections immediately dismissed.

This pattern of findings raised the natural question whether subjects could do better if prompted. Perhaps their thinking was trapped in particular mental models of the problem situation that allowed little latitude for more flexible reasoning. Follow-up studies were conducted with secondary-school subjects using the same methodology for administering the issues and collecting subjects' initial reasoning. At that point, the experimenter intervened, pressing subjects to elaborate the arguments they had already offered. Could they list more reasons on their own side of the case? Could they raise objections to their own arguments? Could they list reasons on the other side of the case? It turned out that subjects could easily do all of these things. The most dramatic extension of their previous reasoning occurred with the otherside arguments, where subjects increased their counts by an impressive 700% on the average. These results suggested what we have come to call the "disposition effect:" People's ability substantially outstripped their performance. For one reason or another, they were not disposed to think nearly as well as they could. Research by others in a somewhat similar style as corroborated such shortfalls (Baron, Granato, Spranca, & Teubal, 1993).

Study #2. The aim of this study was to discover whether the three elements of the triad—sensitivity, inclination, and ability—were indeed psychologically separable. The experiment followed closely the full paradigm described earlier, with 64 eighth graders

addressing 4 stories, each with two thinking shortfalls embedded in them, in a 3-step process that stretched over 2 separate 1-hour periods. The study investigated two thinking dispositions: the disposition to seek alternative options or ideas, and the disposition to seek reasons on both sides of a case. Each of these was examined in two contexts or "problem types," decision making and problem solving. There were four disposition/problem type combinations, each one repeated twice. The Perez story just described is an example of the first combination, the disposition to seek alternative options in the context of decision making.

Performance was scored by counting a subject's hit rate across the three tasks. A hit consisted in the subject underlining the target in task 1, and in all three tasks displaying the thinking called for. For example, a subject doing task 1 might underline Mrs. Perez's "I have no other choice" statement and write either that Mrs. Perez should search for other options (scored as a hit) or actually suggesting other options (also scored as a hit) Final scores were cumulative: task 2 scores were task 1 scores plus new hits on task 2. Task 3 scores were task 1 and 2 scores plus new hits on task 3.

If performance on this task were principally a matter of ability in the sense of being able to generate options or reasons on both sides of a case, then subjects would not add many hits from task 1 to task 2 to task 3. If, in contrast, detecting targets and investing in following through on them were bottlenecks in performance, subjects would add considerably to their task 1 hits on task 2, and again on task 3. This is in fact what happened. Figure 1 displays the cumulative hit counts for tasks 1, 2 and 3, for both options and pros and cons.

Insert Figure 1 about here

Another way of representing the data looks at the ratios task 1 score / task 2 cumulative score, and task 2 cumulative score / task 3 cumulative score. These ratios can be interpreted as probabilities of detecting a hit at task 1 and task 2 respectively. Thus, the first ratio represents the detection probability, or sensitivity. The second ratio represents the follow-through probability assuming detection, or inclination. Figures for this experiment are presented in Figure 2. It is important to note the very low sensitivity figure. In most of the writings on dispositions, the dispositional side of thinking is framed largely as a matter of inclination: the person does not care enough about the matter at hand to invest in careful thinking about it. However, these results suggest that the principal dispositional bottleneck is in fact sensitivity: people do not detect potential shortfalls in the first place.

Insert Figure 2 about here

Study #3. The three-task paradigm in the study just described yielded an instrument that served well for proof-of-concept work, but that was lengthy to administer and time-

consuming to score. The aim of study #3 was to test a streamlined version of the instrument, potentially practicable in classroom settings, that would be easier to administer and score, and also yield more data.

The experiment consisted of a two-task sequence that focused on sensitivity and ability, and omitted the middle "inclination" probe. The justification for omitting the inclination probe was the finding, described above, that the "disposition effect"—the gap between what people *can* do and what they *do* do—is attributable more to shortcomings in sensitivity than in inclination.

In addition to omitting the inclination step, the instrument also used shorter stories. This revised instrument allowed for the sampling of a greater number of disposition instances. With an N of 105, the experiment looked at the same two dispositions as the earlier study—the disposition to seek alternative options or ideas, and the disposition to seek balanced reasons. It examined these dispositions in three contexts, or "problem types"—decision making, problem solving, and causal explanation. In total, subjects did 18 two-task sequences, yielding 18 samples of subjects' dispositional behavior—three times for each disposition-problem type combination.

Performance was scored by using a Likert scale for each task that rated the quality of the performances 1 to 6. The same Likert scale was used for both tasks. Low-rating performances were characterized by sparse, unelaborated responses, premature cognitive commitment, biased thinking, and other factors generally taken to be signs of poor thinking. High-rating performances were characterized by richly elaborated responses, a breadth of ideas, open-mindedness, and so on. Scorers' judgments were made intuitively, with the assistance of heuristic scoring rubrics. After several cycles of refinement in the rubrics and

the scoring conventions, high interrater reliability was achieved. However, scoring turned out to be more lengthy and complicated than anticipated (interestingly, non-intuitive scoring yielded substantially lower interrater reliability than intuitive scoring). Although the instrument was not as easy to score as the experimenters had hoped, the results from the experiment were quite striking.

To measure the disposition effect, results were calculated by creating composite scores for both the sensitivity task and the ability task and comparing their means. However, before simply summing subjects' scores at task one and task two to create composites, correlations between all of the sensitivity task scores on each scenario and all of the ability task scores were computed to determine if in fact the scenarios seem to be tapping into a common construct, either sensitivity or ability. Additionally, internal consistency was assessed and factor analysis was performed.

For the most part, scores on the sensitivity task were moderately correlated and significant, falling in the range of .40 to .60. The same pattern was evident in the scores on the ability task. Reliability coefficients (internal consistency) were high for both task one (Cronbach's alpha Å.92) and task two (Cronbach's alpha Å.89). Factor analysis confirmed that there was only one underlying factor in the data for the sensitivity task, and one for the ability task.

Recall that if performance was principally a matter of ability—if detection of potential shortfalls and investment of mental effort in characterizing them could be taken for granted—the mean for task one (sensitivity) should be close to the mean for task two (ability). A comparison of the means of the composites showed that there *was* a significant difference (F-ratio = 348.288, $p < .0001$) between the means of task one (mean = 31.8, SD

= 8.36) and task two (mean = 44.68, SD = 9.95). The difference in the means of the two groups (approximately 13 points) was almost one and one half a standard deviations, a substantial spread.

To compare the sensitivity and ability performances in terms of hits, as in previous studies, we established a threshold on the rating scales for an adequate performance. Figure 3 shows the results organized by type of shortfall—alternatives and reasons. Figure 4 shows the results organized by the problem type within which the shortfalls were imbedded—decision making, problem solving, or explanation. Both graphs reveal essentially the same pattern: Low sensitivity but reasonably high ability.

Insert Figures 3 and 4 about here

Study #4. The goal of this study was to probe more deeply the nature of sensitivity and the ways in which it constitutes bottleneck to thinking. When subjects failed to detect a thinking shortfall, what went wrong? At least three possibilities came to mind:

1. Perhaps the subjects lacked the knowledge or judgment needed to make such discriminations.
2. Perhaps the subjects had sufficient knowledge and judgment, but did not approach such situations alert to likely shortfalls.
3. Or perhaps shortfalls were difficult to detect regardless of appropriate knowledge

and alertness.

The experiment we designed to examine these alternatives followed the general approach of the first step of the paradigm described in the two previous experiments. That is, it aimed to measure sensitivity by asking subjects to read several short stories and detect shortfalls in thinking embedded in the texts. In this experiment, however, there were no follow-up steps to measure inclination or ability. Rather, two manipulations were introduced, crossed over four conditions. The manipulations were as follows.

Saliency. In two of the four conditions, the stories included underlined text that made the thinking shortfalls visually salient. If detection were the major bottleneck, making the shortfalls salient should allow subjects to explain them well.

Priming. This was an effort to inform and alert subjects to what they should be looking for. In two of the four conditions, a "crib page" of 5 prompts called "thinking handles" was given to subjects at the outset of the test. The instructions urged subjects to adopt a critical mindset to help them identify and discriminate the thinking shortfalls. The thinking handles consisted of sentences like: "this is a place where it is important to look for an alternative explanation" or "this is a place where it is important to make a plan," and so on. In effect, they were efforts to induce heightened sensitivity to particular kinds of shortfalls.

The subjects, 105 8th graders from a middle and working class setting, were divided into four approximately equal and gender-balanced groups, corresponding to the four conditions. Subjects read and responded to eight one-page stories, across which were distributed 30 thinking shortfalls, evenly divided among the five handles and corresponding

dispositions.

Performance was scored in two ways: *detection* and *discrimination.* Detection indicated whether or not subjects detected and underlined a thinking shortfall, regardless of how they explained it thereafter. Of course, detection was only scored in the nonsalient conditions. Discrimination rated whether a response to a thinking shortfall (underlined or detected without underlining) offered a reasonable explanation—one either aligned with the intended one of the five handles or bringing forward another relevant consideration. The results appear in Table 1.

Table 1: Mean Rate of Detection and Discrimination of Thinking Shortfalls in Study #4

	Unprimed condition	Primed condition
Nonsalient condition		
Shortfalls detected	40%	37%
Shortfalls detected and discriminated	35%	31%
Discrimination rate for shortfalls detected	88%	84%
Salient condition		
Discrimination rate for shortfalls made salient	67%	85%

The figures yield an interesting comparison of detection and discrimination rates. Detection rate was much lower than discrimination rate for shortfalls detected or made salient.. The figures also offer a clear reading of the influence of priming and saliency. Priming yielded hardly any difference in the nonsalient condition and a modest improvement in the salient condition, significant at the .05 level. In contrast, saliency, by disembedding thinking shortfalls for subjects, enabled them to achieve a much higher discrimination rate.

The findings suggest that the challenge of sensitivity lies in detecting potential thinking shortfalls in an ongoing stimulus stream and disembedding them for consideration, even when one is capable of making the relevant discriminations and alert to likely shortfalls. The findings resemble that of a test conducted by Norris (1994), referred to earlier, in which subjects were given "surrogate dispositions." Surrogate dispositions were Norris's name for lists of critical thinking guidelines that are given to subjects prior to taking a critical thinking test. The guidelines were in effect an attempt to induce a critical mindset. Norris found that there was not a significant difference in test performance between subjects who received surrogate dispositions and subjects who did not.

How do Dispositions Relate to Abilities?

The findings summarized above make a case that sensitivity and inclination constitute significant components of intellectual behavior, at least outside of high-demand high-task-saliency circumstances. This does not, of course, mean that sensitivity and inclination are unrelated to ability. It might be that they are simply other faces of ability. The

data gathered over several studies permits examining this question in two ways: How do sensitivity and inclination correlate with ability measures in these studies? And how do sensitivity, inclination, and ability as gauged in these studies correlate with IQ or academic aptitude? Low correlations between sensitivity and inclination on the one hand, and ability in the studies, or IQ, or other measures of academic aptitude on the other, would suggest that the dispositional side of intelligent behavior is somewhat independent of the ability side of intelligent behavior. High correlations, of the order one expects in subtests of an IQ test for example, would allow that sensitivity and inclination might represent the same underlying causal factor as ability, although of course correlations are not proof of causation.

During study 1, the study of everyday reasoning, the experimenters also administered a vocabulary-based short form IQ test. The correlations between scores on reasoning on one's preferred side of the case and IQ ranged around .4 to .5. In contrast, the correlations between reasoning scores on the other side of the case and IQ were essentially zero. This suggests the possibility that the disposition to look at the other side of the case is independent of psychometric intelligence, although of course such a result should be corroborated by other studies.

Study 2 included a short-form vocabulary-based IQ test. Unfortunately, the correlations among sensitivity, inclination, ability, and IQ were generally low and unpatterned, revealing nothing about the current issue. The experimenters concluded that, although the data showed strong aggregate patterns as discussed earlier, the instrument did not include sufficiently many items per subject to acquire a good profile of individual performance.

For Study 3, the experimenters could not obtain permission to administer a short-

form IQ test. However, grade point averages were obtained and used as a gauge of academic aptitude. Sensitivity correlated with ability measures at .72. Sensitivity correlated with academic standing at .36. Ability correlated with academic standing at .61. It will be recalled that this study did not collect inclination scores. None of this varied greatly when the two dispositions or the two problem types involved in the study were separated. These data present an ambiguous pattern on the issue at hand, a high correlation between sensitivity and ability as measured, but a lower correlation between sensitivity and academic standing than between ability and academic standing.

In Study #4, the same short-form vocabulary test was used as in Study #2. The nonsalient conditions of course best represented sensitivity, since the thinking shortfalls were not underlined for subjects. The correlations between discrimination scores in these conditions and vocabulary scores were .32 for the unprimed condition and .26 for the primed condition, neither significant at the .05 level. The correlations between discrimination scores and vocabulary scores for the salient conditions were .45 for the unprimed condition and .44 for the primed condition, both significant at the .05 level. Although the contrast between the correlations in the nonsalient and salient conditions is hardly dramatic, it continues the pattern of lower correlations with IQ and related indices for sensitivity measures than for ability measures in these tasks.

Looking beyond our own studies, another dispositional construct noted earlier that has received considerable attention is *need for cognition* (Cacioppo & Petty, 1982; Cacioppo et al, 1996). This measure has been shown to gauge people's inclination to seek out and enjoy complex cognition. Correlations with measures of intelligence have proved to be quite low, ranging from -.03 to .32 in the review by Cacioppo et al (1996). *Need for cognition*

does not distinguish between sensitivity and inclination, although, involving self-assessment of people's conduct as the measure does, it plausibly reflects inclination more than sensitivity.

In summary, there is some evidence that the dispositional side of thinking may be more than just another face of ability in general and psychometric intelligence in particular. However, the evidence is certainly limited and partial.

What Kinds of Thinking Dispositions Are There?

Taxonomic questions lie at the heart of any analysis of intelligence. Spearman (1904) established a case for a single general factor *g* that remains in some ways persuasive even today. Others in the psychometric tradition have proposed multiple factors (e.g. Guilford, 19676, Guilford & Hoepfner, 1971) or significant subfactors (e.g. Carroll, 1993; Horn & Cattell, 1966; Horn, 1989). Within the psychometric tradition, versions of factor analysis have provided the principal techniques for determining components of intelligence. However, other contemporary theories of intelligence adopt more conceptual and interpretive foundations. Gardner (1983) acknowledges that the justification for the component intelligences of his theory of multiple intelligences include considerations of the professions and activities prominent in our culture. Sternberg's (1985) triarchic theory of intelligence appears to be a conceptual construct reflecting several important aspects of intelligent behavior.

Even though this article examines a dispositional perspective rather than an abilities perspective on intelligence, the taxonomic question still applies: What dispositions are there? Although it was noted earlier that thinking dispositions can be negative (close-mindedness) as well as positive (open-mindedness), proposed taxonomies of dispositions

are usually formulated in terms of positive dispositions. As in ability-centered theories, in principal one might look toward factor analytic answers and toward answers more conceptually driven.

We know of only three attempts to achieve the former. The first is the *need for cognition* construct mentioned earlier. A number of factor analyses of *need for cognition* have generally yielded a single factor. A few have yielded multiple factors but not with consistency from analysis to analysis (Cacioppo et al, 1996). The second is the taxonomy of thinking dispositions based on self-ratings developed by the Faciones, discussed earlier, with its seven subdispositions of open-mindedness, inquisitiveness, systematicity, analyticity, truth-seeking, critical thinking self-confidence, and maturity (Facione, Sanchez, Facione, &Gainen, 1994).

The third effort occurred in the course of our own research. The sensitivity data from Study 3 were factor analyzed. The data might have disclosed factors representing the two dispositions involved in Study 3 or the two problem types, or some unexpected structure. However, only a single factor emerged. The contrast between Faciones' and these findings may appear anomalous, but the fundamentally different methodologies should be recalled. The Faciones worked with self-ratings, whereas the studies reported here involved actual thinking performances. We conjecture that the self-ratings yielded a factor structure reflecting cultural attitudes about various aspects of thinking, as elaborated below. In actual performance, attention to one of those aspects may in fact covary with the others, yielding a single performance factor. However, certainly not enough work of this sort has been done to make this more than a speculation.

Most of the proposed taxonomies of dispositions represent reflective analyses of

plausible dispositions rather than empirical methods. Given the emphasis on statistical approaches in the classic work on intelligence, this may seem odd. However, in our view, dispositions have a rather different character than the factors sought in the psychometric approach, which presumably represent neural architecture at some level of analysis. In our view, the dispositions people display are in large part a cultural phenomenon. They are not hardwired into the brain, and taxonomies of thinking dispositions should not be construed as aiming to classify natural classes of neurobiological phenomena. Dispositions emerge from our interactions with the beliefs, values, and norms in our environment, as well as the contextual demands of specific intellectual challenges. For example, the disposition to be open-minded is a *value*, not a natural neurobiological tendency, one connected to a Western, reason-based conception of mind.

At the same time, of course, hardware does impose some broad constraints. For instance, consider open-mindedness, which is emphasized either explicitly or implicitly in all of the taxonomies described in this article. Open-mindedness often manifests itself as a willingness to resist generalizations and consider multiple interpretations or possibilities. While this intellectual value is often underserved, from a computational point of view—whether the computing mechanism is a neurobiological system or a microchip—it would be paralyzingly inefficient to entertain all possibilities all of the time. If we did, we would never get beyond the manifold ways of simply getting out of bed in the morning!

With these points in mind, a further broad distinction among taxonomies concerns grain size. Some scholars claim there is one overarching thinking disposition, while others have put forth taxonomies that include several high-level thinking dispositions. This distinction does not run deep–those who argue for one overarching thinking disposition

readily talk about subdispositions–but it is a useful way to enter the territory.

The view that high-level thinking is characterized by a single overarching thinking dispositions is perhaps most fully worked out by psychologist Ellen Langer (1980, 1989). Although Langer does not herself use the term thinking dispositions, she advances the view that good thinkers have the tendency towards *mindfulness.* Mindful thinkers tend to create new categories, or simply pay attention to given contexts; they tend to be open to new information; and they tend to cultivate an awareness of more than one. Educational psychologist Gavriel Salomon also recognizes mindfulness as an overarching thinking disposition. However, Salomon offers his own list of key characterological components of mindfulness. These include a positive attitude toward ambiguous and complex situations, a preference for novelty and incongruity, and an intention to seek out such situations, or even shape situations in a way that makes them fit the preference (Salomon, 1994).

The philosopher Richard Paul argues that the "strong sense" critical thinker is characterized by the overarching disposition towards fair-mindedness (Paul, 1990). According to Paul, this disposition includes several traits of mind, such as intellectual humility, intellectual courage, intellectual perseverance, intellectual integrity, and confidence in reason. Philosopher of education Harvey Siegel talks about the "critical-spiritedness" required to engage in reason assessment. This tendency, he argues, is composed of objectivity, intellectual honesty, impartiality, a willingness to conform judgement and action to principle, and a commitment to seek and evaluate reasons (Siegel, 1988).

While the above scholars often mention multiple characteristics of their overarching dispositions, they do not intend these specifically as subdispositions. Another group of

scholars have advanced taxonomies of high-level thinking dispositions that include numerous dispositions. For example, Robert Ennis currently recognizes not one, but fourteen separate critical thinking dispositions (Ennis, 1994). According to Ennis, critical thinkers have a tendency to:

- be clear about the intended meaning of what is said, written, or otherwise communicated
- determine & maintain focus on, the conclusion or question
- take the total situation into account
- seek and offer reasons
- try to be well-informed
- look for alternatives
- seek as much precision as the situation requires
- try to be reflectively aware of one's own basic beliefs
- be open-minded: seriously consider other points of view and be willing to consider changing one's own position
- withhold judgement when the evidence and reasons are sufficient to do so
- use one's critical thinking abilities
- be careful
- take into account the feelings and thoughts of other people

Educator Arthur Costa does not use the term thinking dispositions but instead refers to passions of mind (Costa, 1991). He identifies 5 key passions that characterize the good thinker: efficacy, flexibility, craftsmanship, consciousness, and interdependence.

In our own work, we have advanced a view of seven key critical thinking

dispositions (Perkins, Jay & Tishman, 1993), on which the research we described earlier is based. Although the list represents many of the trends in intellectual behavior included in others' list, we acknowledge the taxonomy as unabashedly normative. The claim is that in our culture, these seven dispositions provide the best leverage on the kinds of thinking and learning challenges young people in our society face (Tishman, 1994). They are:

- The disposition to be broad and adventurous
- The disposition toward wondering, problem finding, and investigating
- The disposition to build explanations and understandings
- The disposition to make plans and be strategic
- The disposition to be intellectually careful
- The disposition to seek and evaluate reasons
- The disposition to be metacognitive

Perhaps the most striking difference among the various taxonomies is the grain size at the top level of organization: As noted earlier, some scholars emphasize one overarching disposition with several characteristics or subdispositions, while others emphasize a set of dispositions all at the same level. Other differences concern varying degrees of emphasis on the attitudinal and ethical dimensions of dispositions. Paul, for instance, uses value-laden terms like "integrity," "courage," and "humility" to describe dispositions. Langer places special emphasis on the attitudinal features of mindfulness.

But there are no truly unbreachable differences among the taxonomies. They have considerably more points of agreement than disagreement. They all represent a normative conception of high-level thinking that emphasizes reasonableness and reflection, but not to the exclusion of imagination and creativity. All of them identify several different aspects of

high-level thinking, either as characteristics or subdispositions. Most of the taxonomies emphasize a humane concern for others, in the form of thoughtfulness and respect for other viewpoints. And all of taxonomies emphasize attitude and awareness in addition to ability to perform cognitive tasks.

Perhaps their most striking similarity is that they all share an intellectual ethos that values critical thinking, creative inquiry, and independent thought. This is a Western-based ethos that has been around since before Socrates. It is normative in the sense that it prescribes the type of intellectual behaviors that are most likely to lead to positive knowledge and scientific achievement as defined by our culture. Clearly, other cultural orientations have different conceptions of how best to gain knowledge. For example, some cultures emphasize attentive obedience to authority. Some cultures emphasize spiritual practices that alter consciousness. Some cultures emphasize gaining knowledge by cultivating an intuitive understanding of nature. While the ethos shared by the taxonomies reviewed here is not intended to represent the only or even the best conception of normative intellectual performance, it is decidedly not arbitrary. The taxonomies describe the intellectual behaviors that scholars believe are most likely to yield effective, humane products of thought, within the parameters of the shared culture inhabited by the taxonomies' authors.

A Dispositional View of Intelligence

Theories start with the identification of a problem. This paper began by pointing out a problem with traditional ability-centered theories of intelligence: they account for what people are able to do, but not account for what people often *do* do in everyday circumstances. The concept of thinking dispositions has been advanced as an explanatory

construct that addresses the gap between ability and performance by identifying characterological traits, beyond or in addition to basic intellectual capacity, that are needed to mobilize ability.

The view presented here identifies three distinct and separable components of dispositions: *sensitivity,* which involves detection of occasion, *inclination,* which involves motivation or leaning, and *ability,* which concerns the capability to follow through with appropriate kinds of thinking. Sensitivity and inclination are the dispositional side of the story. A full account of intelligent behavior requires the three aforementioned logically distinct and separable components. The presence of these components constitutes necessary and sufficient conditions for intelligent behavior to be enacted. This triadic analysis of intelligence behavior has yielded a research paradigm that has thus far proven to be fruitful.

Thinking dispositions provide a good explanatory story for everyday intelligent behavior, illuminating cases such as that of the student lawyers, where people are not disposed to use intellectual abilities they clearly possess. But if a good story is to be more than a fairy tale, in the company of intelligence theorists at any rate, it has to have empirical legs to stand on. The research reviewed in this paper shows that thinking dispositions indeed do have a measurable psychological reality, whether they are treated as the other side of abilities (Norris, 1994; Stanovich and West, 1997) or through a triadic analysis into sensitivities, inclinations, and abilities, as we have described in this paper.

There is relative convergence among researchers working in this area on the types of dispositions or subdispositions that characterize intelligence, although the specific lists that are advanced vary somewhat. Broadly, these lists emphasize critical thinking, creative inquiry, reflectiveness and open-mindedness. This normative view of the “right stuff” of

thinking dispositions is without question culturally influenced. But no more culturally influenced than the lists of abilities in classic theories of intelligence. All intelligence theorists, whether they emphasize the dispositional side of thinking or not, are working with a culturally influenced conception of rationality—a conception, that is, of what the goals of intelligent behavior should be, and which abilities and tendencies best serve them.

New theories, if they are to have any shelf life at all, need to do more than simply explain gaps in previous theories. They also must suggest new and fruitful avenues of research. In the case of thinking dispositions, this means research that can shed further light on the mysteries of human intellectual behavior. Several such avenues seem to be suggested by the work reviewed here. For one, there is some evidence that thinking dispositions can predict intellectual behavior in cases where cognitive abilities do not. Stanovich, for example, has shown that dispositions such as dogmatism, absolutism, and open-mindedness can better predict performance on reasoning tasks than ability measures (Stanovich & West, 1997). Research on *need for cognition* has demonstrated that people with high need for cognition look more analytically at arguments and information sources, although not necessarily without bias (Cacioppo et al, 1996). Our own work in the area of sensitivity suggests that sensitivity may explain intellectual performance on everyday reasoning tasks in ways complementary to ability, including IQ. More research is needed that explores the predictive power of sensitivity and inclination across a variety of thinking dispositions and in a range of everyday contexts.

Another promising area of research concerns manipulations that boost thinking dispositions, and in particular, manipulations that boost sensitivity. The research reported in study #4, and Norris's research concerning surrogate dispositions in test-taking situations

(Norris, 1994) suggest somewhat surprisingly that inducing a critical mindset is not an especially effective way to increase intellectual performance. It may not help subjects much to disembed from a noisy context matters that require thoughtful attention. This raises questions about the mechanisms of sensitivity and what might enhance them—for instance affectively-oriented manipulations or manipulations that boost mindfulness.

Yet another fruitful strand of research would address the stability of dispositional traits. Such findings are available for *need for cognition* (Cacioppo et al, 1996). Reliability has been reported for the Faciones' Critical Thinking Disposition measure (1992). And our own work has begun to address the issue of test-retest reliability, with initially promising results. However, more research is needed here, particularly research that looks at a variety of types of thinking dispositions.

Finally, there is the issue of empirically grounding the conceptual work concerning the ontology of thinking dispositions. Several scholars have proposed conceptual schemes that identify different thinking dispositions and subdispositions. These schemes tend to be normatively grounded and logically justified, but empirically undertested. Indeed, a challenge in this area concerns when and how empirical methods should be applied to these schemes. Simply because a disposition is unabashedly labeled a cultural norm does not mean that it is therefore exempt from empirical examination. For example, consider the disposition towards open-mindedness. Empirical methods can be used to examine whether it is an isolatable psychological tendency, regardless of whether it is valued by the culture or not.

This paper has raised the question of whether the concept of thinking dispositions is an illuminating addition to models of intelligent behavior. We have argued that the answer is

yes, and tried to show how the concept has both explanatory power and also the capacity to generate fruitful investigations. The research agendas suggested by the work thus far are rich in possibility. The reward—a deeper understanding of the mechanism of human intelligent behavior and as a result more effective methodologies for cultivating it—is an alluring one, and surely one worth striving for.

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Figure 1

Study #2: Number of responses at Sensitivity, Inclination, and Ability Stages

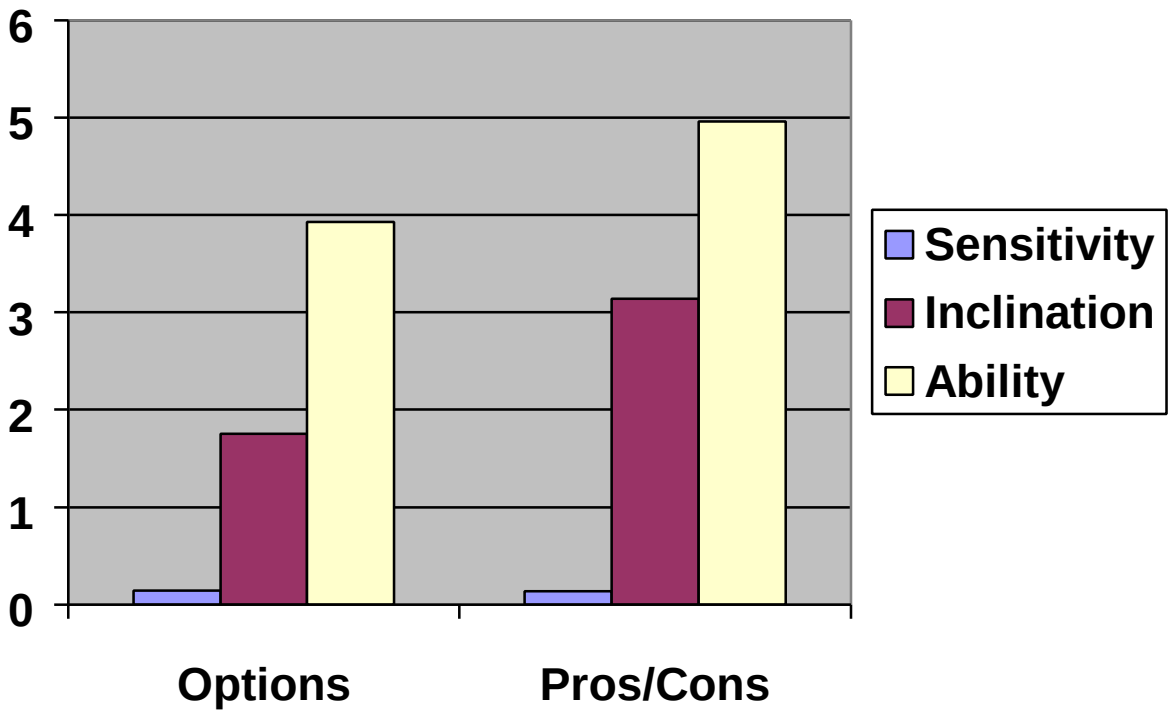

Figure 2

Study #2: Probability of target detection at Sensitivity and Inclination stages

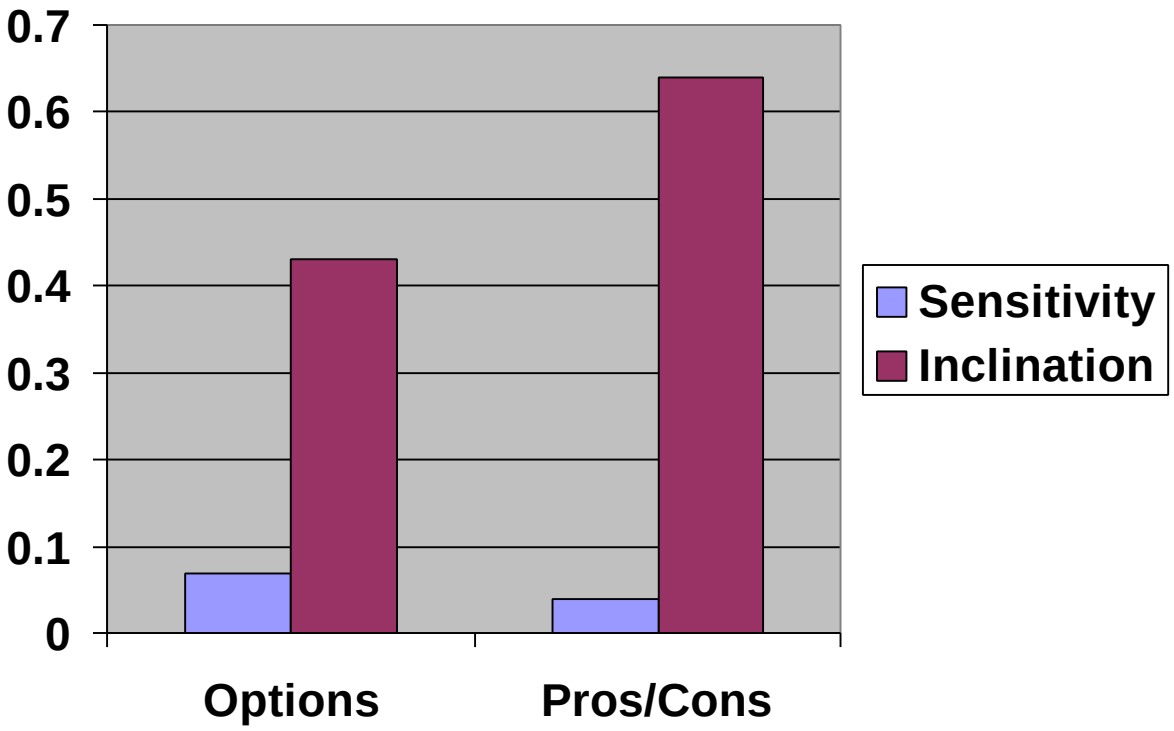

Figure 3

Study #3: Hit rate at Sensitivity and Ability Stages by problem types Decision Making, Problem Solving, and Explanation

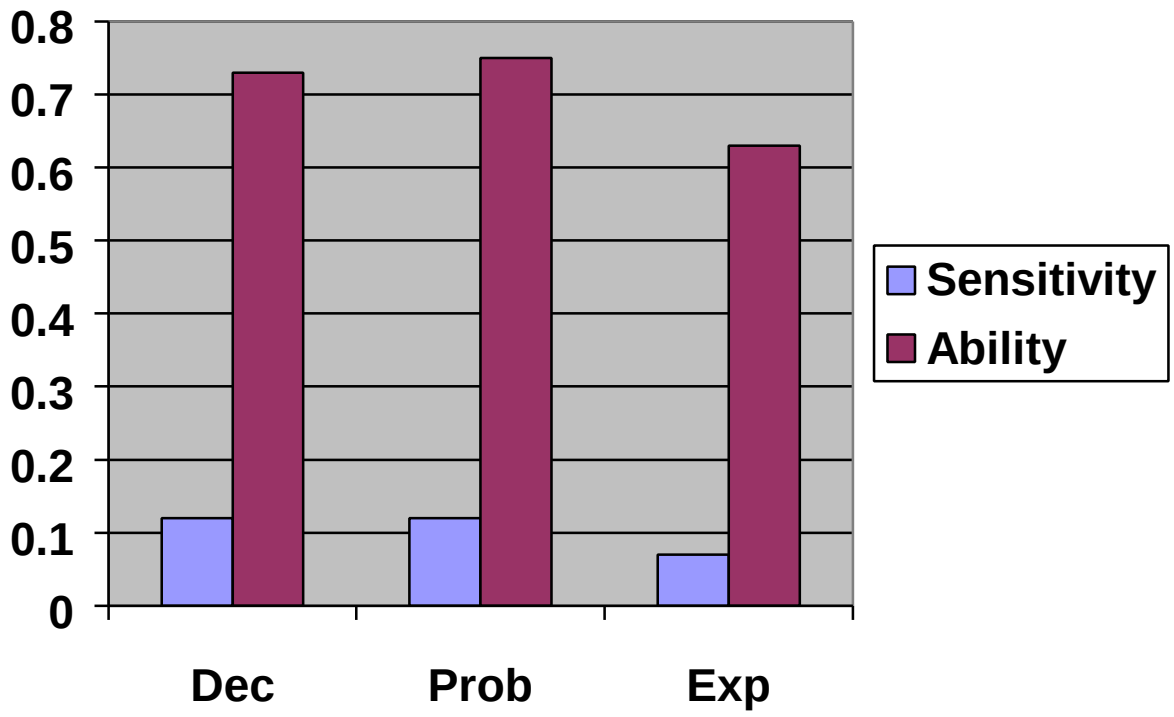

Figure 4

Study #3: Hit Rate at Sensitivity and Ability Stages by dispositions Seeking Alternatives and Seeking Reasons